Vol.4, No.1 Special Issue on New Dimensions in Economics, Accounting and Management
ISSN 1805-3602

The Effect of Eight Weeks of Gymnastics Exercises on the Development of Gross Motor Skills of Five to Six Years Old Girls

Elham Fallah, Parivash Nourbakhsh*, Jaleh Bagherly
College of Physical Education and Sport Sciences, Karaj Branch, Islamic Azad University, Karaj, Iran
*E-mail: parivashnourbakhsh@yahoo.com

Abstract

The aim of the present study was to investigate the effect of pre-level gymnastics exercises on the development of gross motor skills of five to six years old girls. Also, it aimed to examine the effects of exercises on sub-tests of balance, running, galloping, hopping, leaping, horizontal jumping, and sliding. A quasi-experimental research design was conducted. The study samples were preschool girls, randomly placed in an experimental group (n = 20) and a control group (n = 20). The instrumentation included gross motor skill tests of Bruininks-Oseretsky (1978) and Ulrich (2000). Hypotheses testing showed that pre-level gymnastics exercises had a significant effect on the development of balance and gross motor skills of locomotors and sub- scales of its as galloping, hopping, leaping. Therefore, it is recommended to increase learning level and gross motor skill development of children, namely, implement regular and organized motor activities in preschool centers.

Keywords: Balance, Gross motor skill, Locomotors

Introduction

Physical movement is one of the most important aspects of human life, and motor skills allow children gain greater control over their living environment. Fundamental motor skills are the basis of motor skills which children take advantage in their recreational activities and daily life. Because physical activity is an important part of an individual's health and a well-designed motor plan can develop skills related to daily life and help improve the mood and increase the confidence of the child. Motor growth determines the development of human movements from primary and reflective status to the voluntary and advanced, and includes changes in motor behavior as a result of the interaction of his growing organism and environment (Payne & Isaacs, 2011). Among the periods of life, childhood is the most important motor development period. The characteristics of this period are continuous physical, motor, cognitive, and emotional developments (Gallahue, 2003).

Human motor development flows from head to foot, from the center to the periphery, and from the large muscles to the small muscles, and makes possible the child control on the environment. Environmental factors before and after birth play important roles in the evolution and development of human capabilities. Psychologists like Graf, Delecato believe that physical activities and motor experiences in general, are the most obvious and most important environmental stimuli to grow the mental faculties (Hay Wood, 2014). Motor activities create opportunities for learning cognitive concepts and make children enjoy movement (Gilbert, 2011). They also play an important role in the development of gross motor skills and getting the children to master the basic motor skills (Graf et al., 2004), often classified as fine and coarse activities. Fine motor skills refer to activities that need subtlety and dexterity, such as manipulation tasks. Gross motor movements are activities that refer to all or part of the main body movements, such as locomotive activities (Malina & Bouchard, 1984). Gross motor skills relate to the movements of the large muscles (Ulrich, 2000). The main element of motor development is fundamental motor skills which includes the gross

motors (Reeves et al., 1999). Rudimentary or basic motions are the first voluntary movements in humans that are seen in infancy (birth to 2 years of age). Fundamental movements appear after rudimentary motions and consist of three stages of rudimentary, in progress, and advanced. Unlike reflective and preparatory movements that are mostly influenced by genetic factors, fundamental movements, especially in advanced stages are greatly affected by environmental factors. In this period, environmental conditions, such as training opportunities, encouragement, education, and so on play a key role in motor development (Anderson et al., 2012). Fundamental movement period can be seen in three basic stages of the fledgling period (2 to 3 years old), growing or developmental stage in early childhood (3 to 5 years old). Advanced or developed stage can be seen in the mid or late childhood (6 to 10 years old).

Fundamental movements are divided into three fundamental movements of locomotors, non-locomotors, and manipulative skills. Basic and fundamental motor skills are developed and refined through games and gymnastic movements, (Gallahue, 2003). Gymnastics include any physical exercise on the ground designed to improve endurance, strength, flexibility, agility, coordination, and body control, and starts from the fundamental movement. In fact, gymnastic is made of fundamental and basic movements of walking, running, jumping, balancing, and strength and it is very crucial and novices increase their strength and neuromuscular coordination through performing these preparatory movements.

Fundamental skills in gymnastics are divided into three categories: a- Locomotors skills are a group of movements that involve the body moving in any direction from one point to another in flat and different height levels, b- Non-locomotors (stability) skills refer to movements of balance and weight transfer, and c- Rotation skills include skills in which the body rotates around the longitudinal, lateral, or medial axes of the body and should be implemented at various levels and by various means and experience. In fact, by doing the fundamental skills or necessary prerequisites, all muscle groups that are important for gymnastics are reinforced, and flexibility of the muscles, tendons, and width range of joints increase (Mitchell et al., 2012).

Since the transfer of strength development and motor function are in 5 to 8 years of age, fundamental movement patterns reach an advanced form in this period (Malina & Bouchard, 1984). Draper et al. (2012) conducted a research to examine the relationship between the fundamental motor development plan and gross motor skills and cognitive function of preschool children in deprived areas. There was a significant difference in the post-test; the effect of physical activities was greater in the experimental group than in the control group which led to motor development in children.

Movement is the first means by which child understands him and the surroundings and always faces the child with the phenomenon of learning. The child deals with different learning, maybe much of them consist of motor and perceptual-motor learning. Although cognitive-motor abilities with different ratios generate from biological heredity and environment; however, one of the most important environmental factors in the development of these abilities in children is how a child has lived during his life. Providing activities for children to develop these capabilities is important. In the early years, a child with his motor skills development begins to search the environment, gains experience, and learns more and through self-assessment, he finds out his skills, abilities, and weaknesses and forms his self-concept (Butterfild et al., 2002). Cognitive abilities through physical activity, finally improve an individual's cognitive function in later life. In addition, since the combination of two or more basic skills along with perceptual-motor ability forms the sports skills, if suitable situations are not created for the development of these skills at an early age, learning any sport skills later in life will be slow and frustrating. A child, who does not enjoy expertise in motor skills at the level of his own age, would face serious behavioral and

developmental disorders because of being ignored in the games and sports (Efstratopoulou et al., 2008), i.e. a child thinks and plays simultaneously, feels, learns, and becomes stronger, or in other words, playing and physical activity are as a child's life.

Research findings suggest that children who are more successful in running and jumping, playing and do physical activities easily show greater mobility (Yun et al., 2002). Experts perceive the movement development as a sign of healthy children. The main element of motor development is the fundamental motor skills (Welzel et al., 2003). Capabilities in fundamental motor skills can be taken to the necessary functional skills to perform the necessary actions in daily life. Fundamental motor skills refer to gross motor skills, i.e. skills which involve the large muscles of body are the basis of more advanced and specialized motor activities (Fisher et al. 2005). Complexity of modern society, the problems of big cities, living in apartments, cars, and lack of educational facilities have caused movement poverty in children and can lead to weakening of the children's fundamental skills. Given the above discussions and considering that all games and activities are formed based on fundamental motor skills, thus accurate identification of these skills should be taken seriously at early ages.

Due to such problems, creating opportunities for learning motor skills and also controlling the environment for positive intervention of motor development are necessary. Because of the sensitive periods of motor development and because children are sensitive to the exclusion of motor activities, it is necessary for them to acquire the required motor experiences to optimize their growth. Thus, considering the importance of movement in life and its impact on all aspects of human existence, physical activities have an organized role during childhood on children's motor development.

Anderson et al. (2012) examined the impact and role of promoting sports activities on the development of motor skills in preschool children. The effect of physical activity on the experimental group was more than the control group and contributed to motor development in children. Accordingly, it seems that fundamental movements and prerequisite gymnastics programs at daycare centers, sports clubs, and preschoolers can partly compensate for motor limitations of children. It seems that the learning and performance of gymnastics contribute to the growth of individual's motor skill, and concurrently with motor development, raise his flexibility capabilities and strength.

No research has been done in our country in the field of basic gymnastic exercises and its impact on children's motor development. The mission of this sport would be on one hand as the basic exercise, and on the other, an educational and training tool for self-training and facilitating and developing one's material and spiritual dimensions. Thus, finding the most appropriate methods and effective exercises to help motor development speed in childhood by gymnastics is required to assist educators in their mission that is to help improve children's physical and psychological development. As a result, the findings of this research are directly connected to education stakeholders such as educators, teachers, and parents in order to improve gymnastics motor programs and improve the motor development process, thus, helping to develop basic and fundamental movements by complex movements and motor skills, and through contributing to the motor development eventually lead to the future children's success in sports and motor skills.

Therefore, due to the power of sports and playing as valuable training tools in human growth and development (such as motor development), it seems that children should have good facilities in the early years of their life to increase their motor development and gross and fine motor skills. Obviously, parents, relevant organs, and physical education professionals have a huge responsibility in this regard and their most crucial role is to recognize the factors affecting motor development and gross and fine motor skills. In this study, the effects of the basic gymnastics exercises on the

development of gross motor skills in children and programs to enhance these skills are taken into account. It is hoped that this study can be used by parents, educators, and teachers to improve physical growth of children.

Methods

This study followed a quasi-experimental research design. The population of this study consisted of all healthy girls between 5 to 6 years of age attending gymnastics classes in Karaj, Iran. Statistical sample consisted of 40 subjects (20 in the experimental group and 20 in the control group), selected randomly. The data collection tools are as follows: To measure the development of gross motor skills, two tests of Bruininks-Oseretsky (BOTMP) and Ulrich (TGMP -2) were used. Bruininks-Oseretsky motor development test is a set of norm reference test that evaluates motor function in children 4.5 to 14.5 years of age. Ulrich motor development test measures the growth pattern of fundamental motor development skills of children aged 3 to 11 years. The test consists of two sub-tests of object and locomotors controlling. The locomotors sub-test consists of six sub-tests including running, galloping, hopping, leaping, horizontal jump, and sliding. All these movements need the child's coordination and balance when moving in direct or indirect directions. Ulrich gross motor development scores are based on the test items. When scoring, each skill was divided into several sub-skills, and the test items were scored as one and zero indicating whether or not a child shows a specific behavior. An item is scored zero when the child does not have the proper skill, and is scored one when the correct implementation of a skill is shown by a child. The test was administered in about 15 to 20 minutes. Each sub-test had a raw score gained by the sum of the skills' scores, and the maximum was 48.

The scores on Bruininks-Oseretsky motor development test of balance are based on the following items given in the test.a) Standing on one foot on the ground with eyes open. b) Standing on one foot on a balance board with eyes open, c) Standing on one foot on the balance board with eyes closed, d) Regular walking on a straight line with open eyes. e) Regular walking on the balance board with open eyes, f) Walking on heel to toe on the straight line with open eyes, g) Walking on heel to toe on the balance board with open eyes h) Crossing the speed-response ruler on the balance beam.

The first three sub-tests were related to the static balance. The next five sub-tests were related to dynamic balance. Total scores of static and dynamic balance sub-tests indicated the person's overall balance score. Eyes were blindfolded for items in blindfold test, and participants were tested individually. The exercise program was conducted two sessions a week for eight weeks (each session lasted 45 minutes). In this program, after warming up with a variety of walking, jogging, stretching exercises, and group games, pre-level gymnastics movements were investigated. Before and after exercises, both experimental and control groups were assessed to obtain the effect of prerequisite factors on motor development of girls (5 and 6 years old).

Results

Table 1 shows the mean and standard deviation of the pre-test and post-test based on the difference of pre- and post-test scores. As can be seen, in all variables, mean changes of skill development are more in the experimental group than the control group.

Mann-Whitney test results in Table 2 show the pre-level gymnastics exercises' impact on the development of locomotive motor skill in girls aged 5 and 6 years old (the first hypothesis). As the table shows, there was a significant difference between the pre and post differences of development of locomotive motor skill in experimental group (4.05) and the control group (0.000), ($p=0.000$, $u=28$) in terms of average change. In other words, pre-level gymnastics exercise resulted in improved development of locomotive motor skills in 5 to 6 years old girls.

Table 1- Variable description

Variables	Groups	Pre- and post-test differences	Post-test	Pre-test
Balance	Experimental	3.35±2.03	26.25±2.86	22.90±4.08
	Control	0.00±0.97	24.90±2.6	24.90±2.9
Running	Experimental	0.35±0.98	7.75±0.63	7.40±1.31
	Control	-0.20±0.69	7.35±0.98	7.55±0.75
Galloping	Experimental	0.75±0.91	8.00±0.00	7.25±0.91
	Control	0.00±0.45	7.60±0.68	7.60±0.68
Hopping	Experimental	1.45±1.19	9.45±0.88	8.00±1.5
	Control	0.50±0.68	8.05±1.8	7.55±1.7
Leaping	experimental	0.60±0.68	5.95±0.22	5.35±0.67
	Control	-0.25±0.44	5.00±0.72	5.25±0.63
Horizontal jumping	experimental	0.95±1.31	7.65±0.58	6.70±1.3
	Control	0.00±0.97	7.20±0.89	7.20±1.10
Sliding	experimental	-0.05±0.22	7.90±0.30	7.95±0.39
	Control	0.00±0.00	7.90±0.44	7.90±0.44
Locomotive	experimental	4.05±2.66	46.70±1.49	42.65±2.66
	Control	0.00±1.48	43.05±2.18	43.05±2.52

Table 2- Results of Mann-Whitney test for analysis of locomotive skills data

Variable	U	W	Sig
Locomotive skill	28	238	0.001

Table 3 indicates the results of the Mann-Whitney test on the impact of pre-level gymnastic exercises on the development of balance motor skills in girls aged 5 to 6 years old (the second hypothesis). As the table shows, there is a significant difference between the average changes in balance motor skill development in the exercise group (3.35) and the control group (0.00), (p = 0.000, u=21.5). In other words, pre-level gymnastic exercises resulted in improved balance motor skills in 5 to 6 years old girls.

Table 3- Results of Mann-Whitney test for data analysis of balance motor skill

Variable	U.	W	Sig
Balance	21.50	231.5	0.001

The third hypothesis: the pre-level gymnastic exercises affect development of running motor skills in 5 to 6 years old girls. Mann-Whitney test results in table 4 demonstrate that there is no significant difference between the mean change in running motor skill development in the exercise group (0.350) and the control group (-0.200) (p=0.057, u=153.5).

Table 4- Results of Mann-Whitney test for data analysis of running motor skill

Variable	U Sig.	W	Sig
Running	153.5	363.5	0.057

The fourth hypothesis: the pre-level gymnastic exercises affect the development of galloping motor skill in girls 5 to 6 years old. According to the Mann-Whitney test results in Table 5 there is a significant difference between the mean change in the development of galloping motor skill in the exercise group (0.7 50) and the control group (0.000), (p=0.003 , u=106). In other words, the pre-level gymnastic exercises resulted in improved galloping motor skill in girls of 5 to 6 years old.

Table 5- Results of Mann-Whitney test for data analysis of galloping motor skill

Variable	U Sig.	W	U
Galloping	106	316	0.003

The fifth hypothesis: The pre-level gymnastic exercises influence the development of hopping motor skill in 5 to 6 year old girls. Mann-Whitney test results in Table 6 indicate that there is a significant difference between the mean change in the development of hopping motor skill in the exercise group (1.45) and the control group (0.500) (p=0.003, u=97). In other words, the pre-level gymnastic exercises resulted in improved hopping motor skill in girls of 5 to 6 years old.

Table 6- Results of Mann-Whitney test for data analysis of hopping motor skill

Variable	U	W	Sig
Hopping	97	307	0.003

The sixth hypothesis: The pre-level gymnastic exercises influence the development of leaping motor skill in girls of 5 to 6 years old. By looking at the Mann-Whitney test results in Table 7 in can be found that there is a significant difference between the mean change in the development of leaping motor skill in the exercise group (0.600) and control group (-0.250) (p=0.000, u=75). In other words, pre-level gymnastic exercises lead to improved leaping motor skills in 5 to 6 years old girls.

Table 7- Results of Mann-Whitney test for data analysis of leaping motor skill

Variable	U	W	Sig
Leaping	75	285	0.001

The seventh hypothesis: The pre-level gymnastic exercises affect the development of horizontal jump motor skill in 5 to 6 years old girls. Mann-Whitney test results in Table 8 show that there was a significant difference between the mean change in development of horizontal jump motor skill of the exercise group (0.950) and the control group (0.000), (p=0.022, u=120.5). In other words, the pre-level gymnastic exercises resulted in improved horizontal jump motor skill in girls of 5 to 6 years old.

Table 8- Results of Mann-Whitney test for data analysis of horizontal jump motor skill

Variable	U	W	U
Horizontal jump	120.5	330.5	0.022

The eighth hypothesis: The pre-level gymnastic exercises affect the development of sliding motor skill in 5 to 6 years old girls. Based on the Mann-Whitney test results in Table 10 the mean change was not significant between the development of the sliding motor skill in the exercise group (-0.050) and the control group (0.000) (p=0.317, u=210).

Table 9- Results of Mann-Whitney test for data analysis of sliding motor skill

Variable	U	W	Sig
Sliding	210	420	0.317

Discussion and Conclusion

Physical education of young children is about the variety of motor activities to develop fundamental motor skills in children. The purpose of this study was to investigate the effect of pre-level gymnastic exercises on the development of gross motor skills of 5 to 6 years old girls in Karaj, Iran. According to Ozmun- Gallahue theory (1998), development of fundamental motor skills is very important, because through this, children are discovered in the world. The process of learning

these skills should be emphasized in early childhood. Our findings showed that after doing eight weeks of pre-level gymnastic exercises, the post-test scores of the balance sub-tests of the group who had done pre-level exercises of balance had a considerable difference with the pre-test scores, and showed the positive impact of pre-level gymnastic exercises on the development of balance skill. Post-test scores of sub-tests of galloping, hopping, leaping, and horizontal jump with regard to locomotive motor skills of the group who had done pre-level gymnastics exercises showed a significant difference with the pre-test scores. Also it shows the positive impact of pre-level gymnastics exercises on the development of locomotive skills in the sub-tests of the galloping, hopping, leaping, and horizontal jump in the experimental group. But, in the locomotive skills sub-tests of running and sliding, there was not a significant difference between the pre-test and post-test scores in the experimental group. However, the statistical analysis, in which the mean scores are considered, showed a significant difference in the locomotive sub-tests scores, and compared to the control group, a significant development was observed in the locomotive and balance motor skills of the experimental group.

The sub-tests findings are consistent with Zhawi et al. (2014), Draper et al. (2012), Deli, Bakle and Zachopoulou (2011) and are in line with balance sub-test findings of Gao et al. (2011). They further stated that the game, physical activity, and regular movement schedule increases gross motor skills and has a positive impact on improving these skills. Most researchers believe that most children at age 6 reach to an advanced stage of these skills. In the past, it was thought that motor skills are developed only with maturity. But experience has shown that children who spend more time to perform these skills, along with early intervention and education in early childhood, show quite a same amount of development in motor skills as maturity. The results of the study also confirm these findings. Thus, providing regular physical exercises not only strengthens gross motor skills in children, but also improves the motor skills of children with various disorders. Gross motor skills training not only improve motor development and growth, but also help to learn and develop complex sports skills.

According to the results, it is suggested that instructors use gymnastic exercises to improve balance and locomotive exercises and through measuring the balance and gross motor skills in children, with regard to age, identify the motor development of children and plan appropriate exercises.

References

Anderson, G. L., Eric, L. A., & Jose, A. B. (2012). Physical education in kindergarten promotes fundamental motor skill development. Advances in Physical Education, 2(1), 17-21.

Bruininks, R. H. (1978). Bruininks – Oseretsky test of motor proficiency (examiner s manual). Circle pines. MN: American Guidance Service.

Butterfield, S. A., Lehhard, R. A .,& Coladric, T. (2002). Age, sex, and body mass index in performance of selected locomotors and fitness task by children in grades k-2. Perceptual and Motor Skills, 94, 80-86.

Draper, C, E., Achmat, M., Forbes, J., & Lambert, E, V. (2012). Impact of a community based program for motor development on gross motor skills and cognitive function in preschool children from disadvantaged setting. Early Child Development and Care, 182, 137-152.

Deli, E., Bakle, I., & Zachopoulou, E. (2006). Implementing intervention movement programs for kindergarten children, Journal of Early Childhood Research,4(1), 5-18.

Efstratopoulou, M., Simons, J. & Kourtessis, T. (2003). The measurement of thinking creatively in action and movement in mentally retarded and non-retarded children. Journal of Human Movement Studies, 44, 417-431.

Fisher, A., Reilly, J. J., Kelly, L. A ., Montgomery, C., Williamson, A., & Paton, J. Y. (2005). Fundamental movement skills and habitual physical activity in young children. Medicine & Science in Sports & Exercise, 37(4), 684- 688.

Gallahue, D. L., & Donnelly, F. C. (2003). Developmental physical education for all children. Champaign, IL: Human Kinetics

Gao, Z., Hannon, J. C., Newton, M., & Huang, C. (2011). Effects of curricular activity on students' situational motivation and physical activity levels, Research Quarterly for Exercise and Sport, 82(3), 536-544.

Gilbert, J. L.; Harte, H. A., & Patrick, C. (2011). Purposeful play leads to school readiness. Dimensions of Early Childhood, 39 (1), 29-37.

Graf, C., Koch, B., Kretschmann-Kandel, E., Galkowski, G., Christ, H., & Coburger, S. (2004). Correlation between BMI, leisure habits and motor abilities in childhood (CHIL T-Project). International Journal of Obesity, 28, 22-26.

Haywood, K. M., & Getchel, N. (2014). Life span motor development. Champaign, IL: Human Kinetics.

Malina, R. M., & Bouchard, C. (1991). Growth, maturation, and physical activity. Champaign, IL, Human Kinetic.

Mitchell, D., Davis, B., & Lopez, R. (2002). Teaching fundamental gymnastics skills. Human Kinetics.

Payne, G., & Isaacs, L. (2011). Human motor development: A Lifespan approach. McGraw-Hill Publisher.

Reeves, L., Brorder, C.E,. Kennedy-Honeycutt, L., & East, C. (1999). Relationship of fitness and gross motor skills for five to six-year old children perceptual and motor skills, 89, 739-477.

Ulrich, D. A. (2000). Test of gross motor development. Austin. TX: Pro Ed.

Venkadesan, R., & Finita, G. R. (2010). Motor development and postural control evaluation of children with sensorineural hearing loss: a review of three inexpensive assessment tools-PBS, TGMD_2, and P- CTSID. Iranian Journal of Child Neurology, 4(4), 7-12.

Welzel, C., Inglehart, R., & Klingemann, H. D. (2003). The theory of human development: A cross-cultural analysis. European Journal of Political Research, 42, 341–379.

Yun, J., & Ulrich, D. A.(2002). Estimating measurement validity: A Totorial. Adapted Physical Activity Quarterly, 19, 32-47.

Zawi, K., Lian., D, K., & Abdullan, R, T. (2014). Gross motor development of Malaysian hearing impaired male pre and early school children. International Education Studies, 7(13), 242-252.